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EVIDENCE OF THE WORK OF MAN ON OBJECTS FROM QUATERNARY CAVES IN CALIFORNIA¹

By F. W. PUTNAM

In the investigations of the Quaternary caves of California which have been carried on by the Department of Anthropology of the University of California during the last few years, there have been discovered a considerable number of bone and several stone fragments apparently indicating the work of man. If these specimens are actually the evidence of man's work, it is of the utmost importance to have the facts brought out, as the objects in question have been found associated with a fauna which represents an epoch considerably antedating the end of the Quaternary period, and would indicate human occupancy of this portion of the continent at a very remote period.²

The specimens that seem to exhibit evidence of human handiwork of the Quaternary period include a number of polished and pointed bone fragments in most respects similar to the rougher instruments from the shell-mounds, and several other fragments with perforations of such a character that it seems impossible to explain their presence excepting by the agency of man. With these more definite evidences of man's presence there are found in the same strata large numbers of splintered bones, such as elsewhere form a considerable part of the deposits in caves or in shell-mounds that have served as places of human habitation in prehistoric time.

Another class of objects from the caves, which must be considered in connection with the bone specimens, consists of stone fragments exhibiting the undoubted work of man and showing some evidence of having been buried in strata containing the remains of extinct animals.

¹ Read at the meeting of the American Anthropological Association, San Francisco, August 29, 1905.

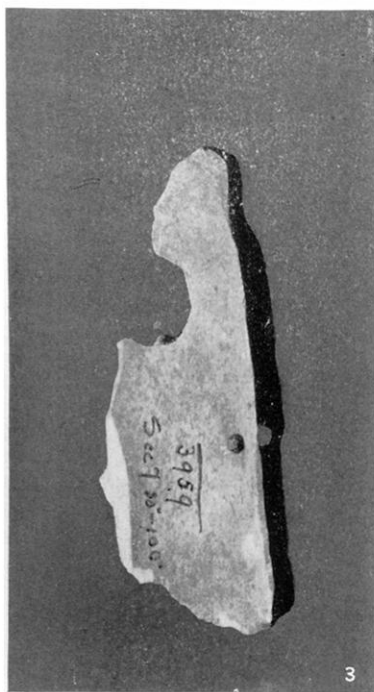
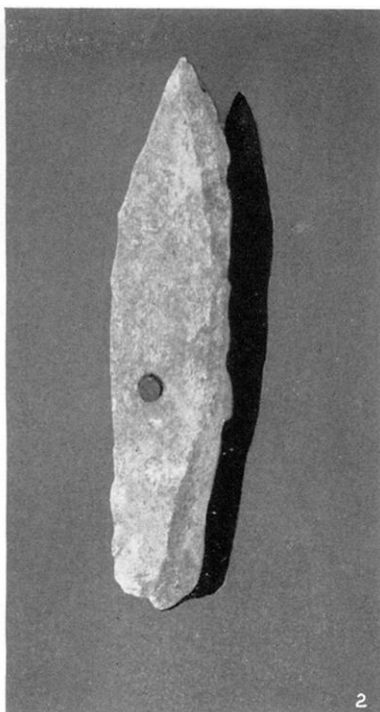
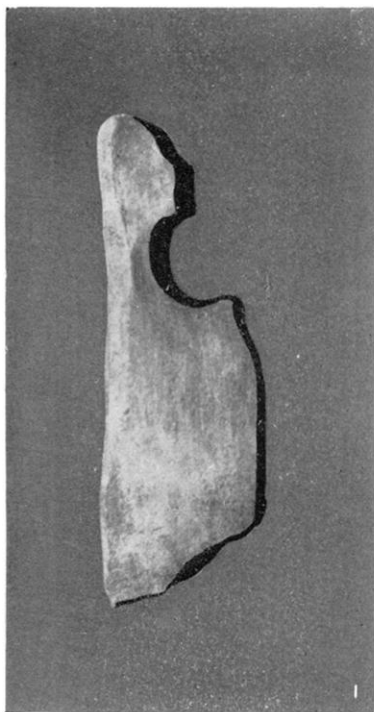
² For a description of these caves and a discussion of their geological age, see the preceding paper by Dr J. C. Merriam.

Of the first class of objects three are figured by Dr Sinclair in his paper on the exploration of Potter Creek cave.¹ Two figures of one of these bones are reproduced here (pl. xvii, figs. 1, 2). This specimen (no. 3894) exhibits quite remarkable oblique beveled edges. The inner side of the specimen shows this very clearly, while the sharp edge produced is shown in the outer view. It is difficult to understand how, by any natural process, beveling and smoothing of this character could have been produced, working from two edges to a terminal point. Moreover, the beveling extends from the softer inner portion of the bone to the denser outer layers, producing the sharp edge where it is most useful. At the end opposite to the beveled portion of this specimen is a distinct notch, quite different from the ordinary reëntrant angles in flaked or broken bone. Its appearance on the same fragment with the extraordinary bevel-edge point, giving evidence of the action of two quite different influences on the bone, makes both the beveled end and the notch appear all the more remarkable.²

Of the fragments showing perforations there are two that have been made the subject of special study. The first of these, no. 3959 (pl. xv, figs. 1-4; pl. xvi, figs. 3, 4), is a thick fragment of bone showing several notches or perforations that do not appear to have been formed in any natural way. It was found by Mr Sinclair between 70 and 80 inches below the surface in section 7 of the deposits in Potter Creek cave. Possible explanations of the occurrence of the foramina in this specimen are that they are natural; that they have been formed by the gnawing of rodents or the boring of insects; or that they have been produced by heavy, angular bodies falling upon them, the rough edges afterward being smoothed by water action. In order to test these suggestions as carefully as possible, every effort has been made to determine the particular bone

¹ *University of California Publications, American Archæology and Ethnology*, vol. 2, no. 1.

² The plate in Mr Sinclair's paper contains for comparison the figures of two unquestionable bone implements from the ancient shell-heap at Emeryville, and any one familiar with the pointed and cutting implements made of splinters of bone, which are so abundant in shell-heaps and other accumulations of human debris, will readily accept these pointed and perforated bone splinters from the caves as implements of the same character.



BONE FRAGMENT FROM POTTER CREEK CAVE

(Department of Anthropology, University of California, No. 3959. Natural size)

1, Outer surface, showing semicircular notch near the pointed end. 2, Outer surface, left side, showing circular perforation and probable cutting at ends. 3, 4, Inner surface. (In figure 4 the bristle passes through the small hole at the edge of the bone.)

or part of bone which this fragment represents. After having passed through the hands of Mr Sinclair, who did not reach a definite conclusion as to its character, the specimen was examined by a number of eminent comparative anatomists, including Dr G. H. Parker, Dr W. D. Mathews, Mr J. W. Gidley, Mr F. A. Lucas, Dr A. Hrdlička, and Dr F. W. True, all of whom agree that the perforations are not natural. Messrs Mathews and Gidley have kindly expressed their opinion in the following statement :

“Specimen (no. 3959) from Pleistocene cave deposit of Potter creek, California, submitted for examination by Professor Putnam.

“The specimen is a fragment of a shaft of a limb-bone of some mammal. It is too much worn and uncharacteristic for positive identification, but appears to be part of the humerus of a ruminant, probably from the external side near the distal end of the shaft, and compares most nearly with *Ovibos*. It is pierced by a complete circular hole and deeply notched by a much larger oval hole of which the outer side is broken away. These are not like the natural foramina of bones in the appearance of their edges, nor is there any possible identification of the fragment in question which would give them the position and size of naturally occurring foramina.

“They are not the work of water acting by solution, as shown by the uniform diameter and regularly circular form of the smaller one, and the beveled, not rounded, edges of the larger one.

“They are not the work of insects or of boring molluscs, as is proved by the slight beveling of the external and rounding of the internal margin of the smaller hole, and by the strong and irregular beveling of the larger one, as well as by other features of position, direction, etc.

“They are not the work of rodents: this explanation is out of the question for the smaller hole, and must be rejected for the larger one from the absence of any marks of gnawing teeth around the margin of the hole, its form, the thickness of the bone at the part pierced, and other considerations. Parts of the edges of the fragment bear the marks of gnawing teeth very clearly defined; this gnawing must have occurred after the fragment was broken to its present form, while the larger hole was made when it was more complete than it now is.

“These holes could not have been punctured by the teeth of carnivora, the beveling of the edges of the larger hole, and the small size and uniform diameter of the smaller one forbidding it.

“The only alternative of which we can conceive, and in our view the

only possible explanation of these holes is that they are the work of man. The end of the fragment has also two or more slight notches, the margin of which is like that of the incomplete hole mentioned. These also are probably of artificial origin and can hardly be explained by natural splintering of the bone, or as the work of carnivora or rodents.

"We therefore endorse without question Professor Putnam's view that this bone certainly shows the handiwork of man, and we take pleasure in expressing our acknowledgments for the privilege of examining it.

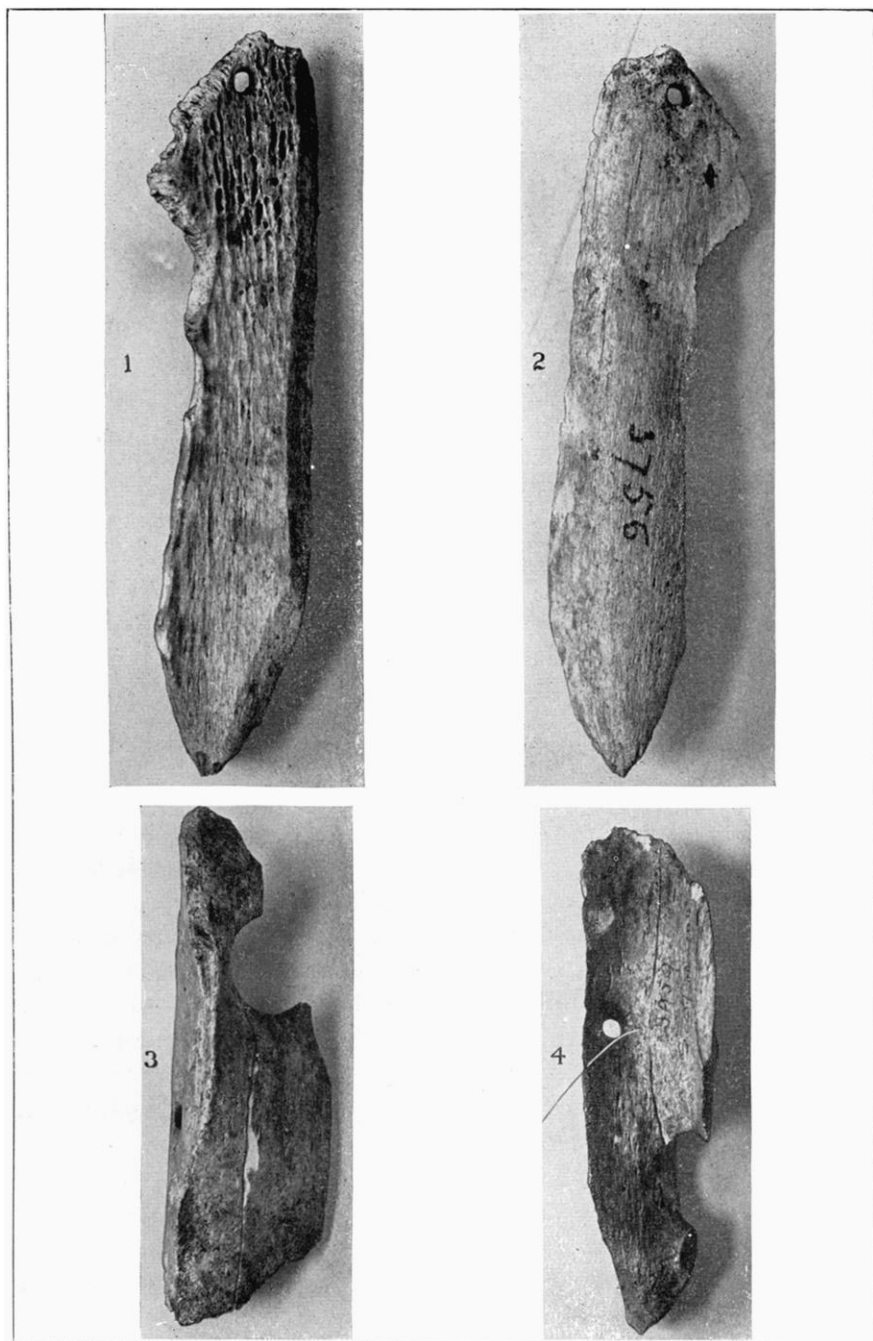
[Signed] "W. D. MATTHEW, J. W. GIDLEY.

"AMERICAN MUSEUM OF NATURAL HISTORY,
February second, 1905."

As the musk-ox is unknown in the Shasta cave fauna it is not probable that this specimen represents a bone of one of these animals. There were, however, in these caves abundant remains of the new genus *Euceratherium*, a large sheep-like animal related to the musk-ox and possessing bones quite similar in form and size. *Euceratherium* was one of the more common ungulates at the period when the cave deposit was forming and would have served as one of the principal food supplies for early man if he were living in this region at the time. The form of this fragment agrees as closely with that of the distal end of the humerus of *Euceratherium* as it does with that of *Ovibos*, and there is good reason for believing that it represents that bone. In the humerus of *Euceratherium* the foramina are similar to those in *Ovibos*, and there are no natural openings that correspond to the perforations seen here.

The smaller completely enclosed perforation in the specimen (pl. xv, figs. 2, 3, 4; pl. xvi, fig. 4) is almost circular in outline, is nearly normal to the surface of the bone, and is slightly beveled on the margins. The cutting of the hole and the beveling are not accompanied by much cutting of the natural canals of the bone, but the form and direction of the holes are not comparable with those of ordinary natural foramina.

Close to the smaller perforation is an exceedingly small opening, about half a millimeter in diameter, indicated in the illustrations (pl. xv, fig. 4; pl. xvi, fig. 4) by a bristle. It may represent a natural foramen or it may be artificial; it is difficult to determine its true nature.



BONE FRAGMENTS FROM POTTER CREEK CAVE

(Department of Anthropology, University of California. Natural size)

1, Inner side of splintered fragment (in the upper end there is a nearly circular perforation); No. 3756.
 2, Outer side of the same fragment. 3, Another view of specimen 395, shown in Plate xv. 4, Inner view of the same.

The second specimen, no. 3756 (pl. xvi, figs. 1, 2), represents a large fragment splintered from a heavy limb bone. It was obtained 40-50 inches below the surface in section 6 of the Potter Creek cave. One end is pointed and somewhat beveled by splintering, the other is slightly worn and has been much gnawed by rodents. In the rough end of the fragment is a nearly circular hole, about 3 mm. in diameter, cutting the bone along a line nearly normal to its outer surface. The hole is quite sharply cut, and the edges, both at the outer and the inner ends of the aperture are very little worn. Viewed from the inner side by means of a hand lens one can see that the coarser canals of the bone are distinctly cut across by this perforation. Although I am not able to determine with certainty the bone from which this fragment came, it is probably a splinter of a leg bone of one of the large ungulates. The opening appears quite different from a natural foramen, as the edges are sharp and the canals of the bone are crossed in an unnatural manner. The course of the opening, moreover, is transverse to the axis of the bone, whereas most foramina in bones of this character enter at an angle of less than 90 degrees.

It should be noted in connection with the study of this specimen that the end in which the perforation occurs is somewhat worn and that the opposite end is splintered in such a way as to form a natural bevel on both sides, coming to a point somewhat as in specimen no. 3894 described above. While I do not wish to assert positively that this opening was made by the hand of man, I cannot conceive of any natural way in which such a perforation could be produced, and certainly the present evidence points to man as the active agent in its production.

The polished and perforated specimens mentioned above are found in association with a large number of splintered bone fragments derived largely from the breaking up of long-bones of large ungulates. Of these there are many hundreds of specimens occurring in nearly all layers of the deposits. On only a few of the splinters are there marks such as would be made by the teeth of carnivora in crushing the bones. In the absence of definite evidence of the fracture of these bones by large carnivora, one is forced to suspect that man has been the active agent here as in the shell-

mounds, where the numerous fractured and splintered bones are unanimously attributed to the work of man.

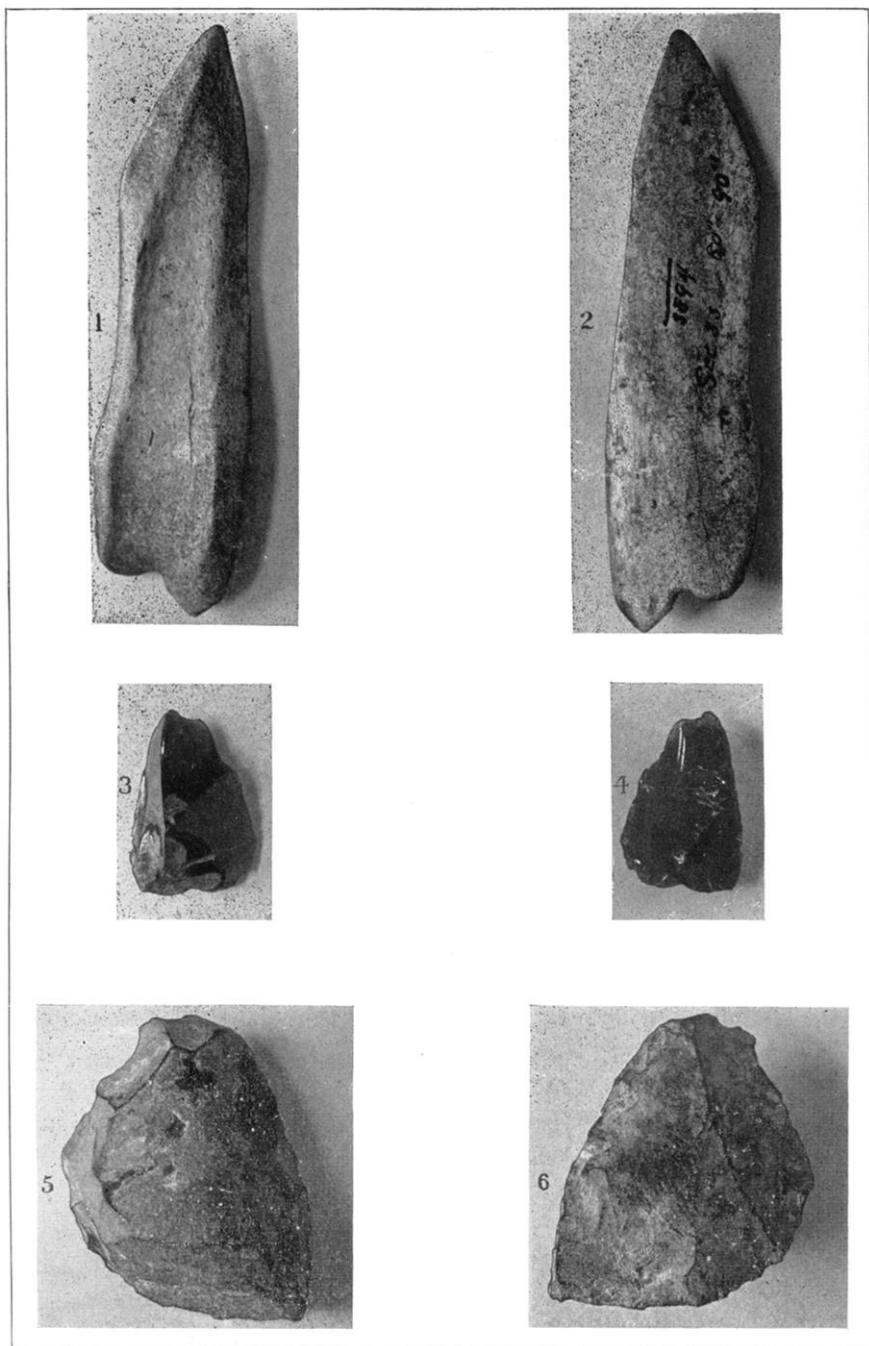
Of the stone fragments mentioned above as occurring in these cave deposits, two were found in Samwel cave. In these two specimens there is no doubt of the handiwork of man. The first specimen, no. 10012 (pl. xvii, figs. 5, 6), was obtained by Mr E. L. Furlong, in 1904, in the fissure deposit of the upper chamber of Samwel cave. It was found six inches beneath the loosened stalagmite layer after a blast to break up the dense rock. The specimen is a distinctly chipped basalt fragment. It seemed to belong to the loosened earth in which it was found. Its surface is partially covered with a thin calcareous coating. In and on the stalagmite above it numerous remains of extinct animals were obtained.

The second specimen,¹ no. 10011 (pl. xvii, figs. 3, 4), is a distinctly chipped obsidian flake obtained from a shaft sunk into the deposits filling the old entrance of the large lower chamber of Samwel cave. This specimen was not seen in place, but was brought up in a bucket filled with moist earth from the bottom of the shaft, then eleven feet deep. The earth around the mouth of the shaft was quite dry, and if the fragment did not come from the layers below, it must have fallen into the shaft in the course of the workings and have been buried in the moist earth below. The surface of the specimen was partly covered with a thin calcareous incrustation. The layer exposed at the bottom of the pit at this time underlies strata containing remains of an extinct ground-sloth.

While we cannot state definitely that either of the stone fragments actually occurred in the Quaternary deposits, there is at least strong presumptive evidence in favor of their having been derived from these beds, and that they were the work of men existing in this region before the Quaternary fauna became extinct.

In concluding this brief statement relating to the supposed evidence of man's handiwork in the Shasta caves, it seems to me that the two perforated bones here illustrated are sufficiently important to warrant the belief that man inhabited the vicinity of the caves at least as early as the latter half of the Quaternary period. At all

¹ This specimen was obtained in the summer of 1905, during the progress of the work carried on under an appropriation by the Archaeological Institute of America.



BONE AND STONE FRAGMENTS FROM POTTER CREEK AND SAMUEL CAVES

(Department of Anthropology, University of California. Natural size)

1, Inner side of polished bone fragment from Potter Creek cave (No. 3894). The upper end is beveled at both edges. A shallow notch is seen at the lower end. 2, Outer side of the same. 3, 4, Opposite sides of a chipped obsidian flake from Samuel cave (No. 10011). 5, 6, Opposite sides of a chipped basalt fragment from Samuel cave (No. 10012).

events, until it is proved that the perforations and the beveling of the points on some of these bone splinters were made without man's agency, archeologists will, I think, accept the specimens here described as primitive forms of bone implements.

The fact that only a few pointed bones with perforations were found is in conformity with our experience in the explorations of shell-heaps and village sites, where hundreds of simple pointed implements made from splinters of bone have been found, but seldom one with a perforation.

The very large number of splinters of long-bones of various mammals, found in the caves, is of importance in this investigation, since they are of the same character as splinters of marrow-bones that are found on so many ancient sites of man's occupancy. The very small number of splinters showing marks of the teeth of carnivora, and the difficulty of accounting for such large numbers of bone splinters otherwise than by man's agency, should also be given due consideration.

The exploration of other caves in this vicinity will probably bring to light much of importance in relation to early man in California. It is with pleasure that I acknowledge my great indebtedness to Dr J. C. Merriam for his hearty coöperation in these explorations, in which his knowledge of geology and paleontology has been of the first importance, as shown by his exceedingly conservative paper on this subject, in which he gives a general review of the researches that have thus far been carried on by the University of California.

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